

SIXPENCE

MARCH 1943

# AMATEUR RADIO

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OF  
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# AMATEUR-RADIO

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## NOTES ON RECEIVER DESIGN

(From an article in 'Radio' by David Eby Jnr.)

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The prime requisite of a communications receiver are sensitivity, stability, high signal-to-noise ratio and ease of control. A few ideas with regard to improving these essential characteristics are incorporated in this article.

SENSITIVITY AND NOISE. The sensitivity of many receivers is far below the ideal and there are numerous factors that impair the ability of the RF stages to bring weak signals up to a useful level. The first tuned circuit is the most important, in-so-far as signal-to-noise ratio is concerned, and the first RF stage must operate at optimum efficiency for good weak signal sensitivity. The tube in this stage must have low inherent noise output and the tuned circuit should have high selectivity.

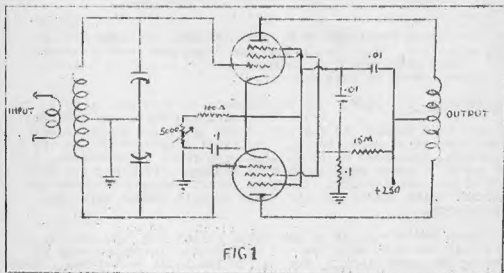
From the viewpoint of low noise output the tube 1851 is most suitable; but this tube has the unfortunate characteristic of loading the grid circuit, due to its low input resistance. Grid circuit loading may be reduced however, by the use of a push pull tuned RF stage (Fig 1) and by this means the excellent low-noise characteristics of the 1851 may be realised. In this circuit, the grid input resistance is increased, the Q is raised and the gain lifted above that of a single ended stage.

In a push-pull tuned RF amplifier of this sort symmetry is very important, lead lengths on either side of the circuit must be uniform and capacities kept equal. Grid leads particularly should be kept the same length and in the same relation to chassis and other components.

INTERMEDIATE AMPLIFIER. It is important that stability be built into the intermediate amplifier, for if the IF amplifier is off peak or drifts off peak, the weak signal gain will be less than a strong signal gain below a certain level.

If 1851's are used in the RF and mixer stages high gain should not be incorporated in the IF stages; it is preferable that lower voltages be used and the job of bringing a signal up to a useful level left to the AF amplifier. In a two stage IF amplifier the plate voltage should preferably not exceed 50 volts. The low voltage gives sufficient gain and much greater stability.

If higher plate voltage is required (up to 250 volts) it is preferable to use a band-pass amplifier; an immediate advantage is gained by the flat-top resonance curve for in this case drift, if not too extensive, has little effect on gain.



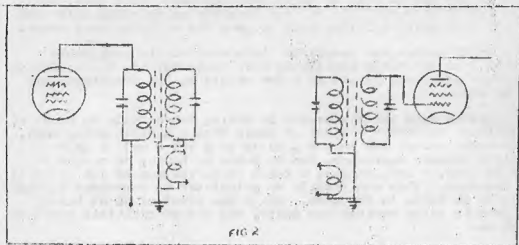


FIG 2

BEAT OSCILLATOR STABILITY. In the usual beat frequency oscillator a coil-condenser unit is used as the frequency controlling element and frequency drift is frequently experienced. If a crystal controlled beat-frequency oscillator is employed drift can be kept very low. The receiver can be shaken without altering the pitch of the beat note, provided of course, the high frequency oscillator is also stable.

The crystal used must be of the zero drift type, and the IF amplifier must be aligned to the desired beat frequency. The IF frequency must be kept to one side of the crystal frequency by a degree equal to the beat note desired. These adjustments are not difficult if a good signal generator is available.

In a receiver incorporating these features it is possible to use the dial calibrations to an accuracy better than 250 cycles one minute after the receiver is turned on. A large part of the stability is attributed to the low plate voltages employed.

.....XXXX.....

ITEM.....The problem of an airtight seal between metal and glass in the manufacture of high-power transmitting tubes has heretofore been solved by the development of a special nickel-iron-cobalt alloy which has the same co-efficient of expansion with temperature as the glass. Drs. Hull and Navais of G.E. Laboratories have recently reversed the technique by inventing a type of glass with the same co-efficient as that of iron. Since nickel and cobalt are used in many ways for war equipment and their supply is extremely limited, the new invention is an important one.

.....XXXX.....

## HUM

We may not be able to build new equipment these days, but time can be very usefully devoted to rewiring existing gear with an eye to getting a little more program and a little less noise.

Fifty cycles and associated harmonics may be acceptable enough from the audio oscillator when tuned for it, but otherwise they are unwelcome guests so a few points on hum banishment may be of interest.

Let us open the discussion by taking for example the case of amplifiers to supply 6 watts of audio from a dynamic microphone. (Six watts across 600 ohms = + 30 db on zero 6 mw) A good quality dynamic microphone can be taken as having an output of -85 db (ref. 6 mw), so that a total amplification of 115 db would be required. This can readily be calculated to represent 0.000107 volt to 60 volts in 600 ohms. Now a hum level of 30 db below program is quite audible and nasty, but let us take this level to work on!

It follows from ground already covered, that if an audio signal voltage of 1 millivolt is applied to the input of the amplifiers, it will cause a signal voltage of approx 60 to be developed across output, so that if a hum voltage of this magnitude is also applied at this point, 60 volts of hum can be expected at output. If hum is to be kept at least 30 db below program, the hum voltage picked up at input must be 30 db less than the 1 mv. already quoted. This works out at about 3.4 microvolts. That's all the maths; don't go away.

What can cause hum voltage pickup of up to 3.4 microvolts at the amplifier input or voltages of greater magnitude in later stages? Plenty.

Power transformer, AC wiring, turntable motor, pickup equalizer, filter reactor, condensers, heaters and heater wiring etc. The above can cause hum by either electro-magnetic coupling or electro-static induction into the high impedance input circuits.

At this stage it is best to be clear as to the difference between the above two types of hum. The names of course are self explanatory but are all of us really able to differentiate between the two when we hear them? Be honest. Alright, the hum set up by electro-static induction is more of a hard nasty sort of noise rich in harmonics, whereas the electro-magnetic induced hums usually take the form of pure 50 or 100 cycle stuff. The reason for this is that the capacitive coupling presents less impedance to the harmonics than to the fundamental hum frequencies.

Consider the power transformer first. Take for example a transformer having 3 turns per volt, that is 1/3rd volt per turn. Even allowing for its shielding it would not take much coupling to induce 3 microvolts in nearby wiring, and if this wiring should have anything to do with input circuits!!

The power transformer also induces voltages into the chassis according to the leakage flux lines cut by the chassis metal and these voltages can readily flow in wiring of the amplifier proper as the wiring usually has less reluctance than the metal of the chassis. Hum results if this wiring is part of input stages.

Filter Condensers. The first condenser of a condenser input filter, usually abt 8 mfd and having an AC ripple component of about 30 volts to 400 volts DC. Reactance of 8 mfd at 100 cycles is approx 200 ohms so current of approx. 150 ma would flow through it and its associated wiring. If the condenser is wired with 6 inches of 20 gauge stuff the voltage drop across the wiring would be approx 0.0005. If the condenser was slopped in haywire fashion with a lump of 30 gauge (who hasn't done it?) the voltage drop would increase to 0.0045. Pooey, what of it you say. OK, but remember, if this wiring should get near the input circuit induction of less than 1000th would overstep the hum maximum we have selected.

So much for that. Satisfied we are that hum can be put in, and now for the remedies.

Firstly, if high gain is required it is sound practice to provide it with amplifiers on separate chassis. In this way the power supply equipment can be mounted on same chassis as the power stage, and the low level stages can be effectively isolated. Electro-magnetic coupling to input stages is reduced and trouble due to induced chassis voltages minimised.

Careful placement of inductances in respect to each other is helpful in assisting to overcome hum difficulties. For best results the amplifier should be wired up with iron cored components not screwed down and with rectifier voltmeter or loud-speaker across output the inductances should be juggled around until position of minimum coupling is found. It may not look nice to have some component on the skew, but its far better than having a geometrical layout plus hum.

Induction from turntable motor, AC wiring etc. must be taken into account. If the pickup has an equalizer, it should be moved around in the cabinet until hum pickup disappears.

The heater wiring of low level stages should be twisted tightly and shielded. Remember that optimum conditions exist if the two wires of the heater circuit taking current in opposite directions were to occupy the same position in space. Under these conditions the fields would entirely cancel. Do the next best thing by tightly twisting the two wires. The shielding is useful in guarding against hum induction by capacitive coupling to input circuits.

Taking an ordinary pentode as input stage a little thought will convince that hum induced into any of the input wiring is similar to applying the same voltage directly across the input jacks so the following precautions should be taken; Do not rely on chassis for earth returns. Make direct connections and take all earth connections for each individual tube wiring as near as possible to one common point. Keep in mind that for ideal results the amplifier itself should touch the chassis at one point only.

Do not encourage coupling between grid and plate resistors by wiring them side by side. Shield grid leads. Avoid using spare pins on the valve sockets to anchor wiring unless no capacitive coupling is likely to result. Shield volume controls in low level stages.

Regarding volume controls, it is better to pad down the output of the low level amp to reduce volume than to cut down the signal input itself. If the signal input is attenuated the hum pickup remains the same whereas attenuation at output reduces hum and signal in same ratio.

There is no need to stress the importance of earthing. Every low level unit must be carefully earthed. That includes turntable and equalizer of course.

Talking of earths, quite a lot of mains interference is caused by pickup in the aerial coil of a receiver. This is caused by connecting earth end of input coil to chassis instead of directly to ground. A portion of any interfering signal travelling to chassis per medium of power wiring flows through the input coil and returns to ground via capacity of antenna and its lead-in. This interference can be cured by running separate earths for chassis and aerial coil.

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ITEM...Air-cooled transmitting tubes are now being made in sizes up to 25KW. The heat dissipated by one of the large tubes is sufficient to heat a six-room house in winter... and we can well believe it.

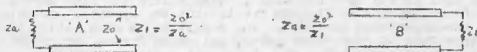
.....oOo.....

# OUR PROBLEM

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Last month we published a problem of one of our readers. In response to our request for a solution Cecil Waring VK3YW forwards his solution to the problem.

In "Amateur Radio" for February you have a problem as to why a 208 ohm quarter wave "Q" section is necessary to match a 600 ohm line to an antenna with an impedance of 72 ohms at its centre. To explain this it is necessary to delve into a little theory and do some maths both of which are fortunately brief,



In Fig. 1 "A" and "B" we have a quarter wave matching section of impedance  $Z_o$  terminated in "A" by impedance  $Z_a$ , and in "B" by impedance  $Z_1$

Referring to "A" impedance  $Z_1$  looking into a quarter wave line of characteristic impedance  $Z_o$  when terminated by an impedance  $Z_a$  is:-

$$Z_1 = \frac{Z_o^2}{Z_a} \dots\dots\dots L$$

Similarly the impedance at the other end (as in Fig. 1 "B") when terminated by  $Z_1$  is:-

$$Z_a = \frac{Z_o^2}{Z_1} \dots\dots\dots 2$$

Thus to match to impedances  $Z_a$  and  $Z_1$  it is only necessary to insert a quarter wave section of characteristic impedance

$$Z_o = \sqrt{Z_a \cdot Z_1} \dots\dots\dots 3$$

Now the impedance  $Z_a$  can be the impedance of the antenna (72 ohms) and  $Z_1$  can be the impedance of the transmission line (600 ohms). Substituting for  $Z_a$  and  $Z_1$  in formula 3 we get  $Z_o = 208\text{ohms}$ . If you go further and substitute for  $Z_o$  in formulae 1 and 2 you will find both work out to 72 and 600 ohms.

Owing to the transformer action of the quarter wave "Q" section the 72 ohm impedance of the antenna is reflected as a 600 ohm load to the feeder and the 600 ohms of the feeder is reflected as an impedance of 72 ohms to the antenna; the action being the same as when we connect the loud speaker to the power tube, we insert a matching transformer and thus match the 2 or 3 ohms of the voice coil to the 5000 ohms or so of the output tube. The wrong transformer will work of course. The same applies to the matching "Q" section.

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### GRAPHITE SHIELDING

(From an article by B. H. Porter)

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Metal and rubber shortages affect everyone in time of war. The use of non-metal shields for research and necessary construction is but one of the many ways to conserve scarce materials.

The non-metal substance that makes this possible is an interesting one. It is Graphite--not the earth ingredient of certain pencil leads, but the artificial electric furnace variety--that is best suited to radio uses. Subdividing the flat particles to permit suspension in liquids facilitates the spraying and painting of non-conducting surfaces. The result is an even, electrical conducting film of grey-black color, polishing forces and graphite particles together reducing the electrical resistance of the coating.

When using this colloidal graphite, dilute the heavy black paste with distilled water. This is done by slow addition of the paste while stirring thoroughly. Any masses that do not form a good suspension are removed by straining through silk or other closely woven cloth.

The prepared mixture is then ready for application to many grease proof surfaces. Glass for example should be clean with solvents for grease or with chromic acid (take care handling this stuff). Metals, wood and plastics are cleaned by abrasion with sandpaper or scouring powder. Extra protection can be given by a coat of nitro-cellulose varnish. Metal eyelets are handy for making the necessary electrical connection to the shield.

When metal shields for tubes are unavailable, shield the tube by covering the glass with colloidal graphite. One part of the paste to three or four parts of water will serve the purpose. If the tubes are the type that generate considerable heat during operation apply the graphite film in a lattice or screen fashion. Both types of coatings may be grounded by continuing the covering down over the walls of the tube base to touch a lead mounted on top of the chassis.

Other applications involving the one abundant metal supplies may suggest themselves. In such instances the electrical conducting properties of colloidal graphite films are worth investigating.

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Anyone got some ideas....Send them along for the information of other readers .....Editor.

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SLOUCH HATS and FORAGE CAPS

... By 2Yc ...

February notes...a year after Singapore... a year since 2HZ and the fell into Jap hands...lets hope we soon hear some news of the m and in the meantime I'm sure you all join me in wishing them "best of of luck".

Seems to me that these sailors are faced with a bit of a problem. Even that coterie at Canberra are silent on the subject.. oh 4RF & 2EO. I suppose they are all working hard, but silently... like the Service. Hi!

2QL reports from one of those Townsville Post Offices that simply mean that they are NOT in Townsville. Frank says he used to wonder why they wanted so much equipment in our Northern Bastion but after seeing what the country was like and what has been achieved he marvels that they wanted so little. Hi!

Did you hear about the chap up there who was found wandering around searching for a pedal to put on a broken megacycle Hi! Keith Sherlock and VK3ML are mentioned in the next line, so whether one of these were the responsible person, one wonders.

Sign posts up there sometimes read "this marks the furthestmost advance of the Japs at such and such a date." They should have some other posts over the East coast by now Hi! So far the closest the Nips have dropped some bombs to 2QL is about a hundred yards, and as a slit trench is said to be effective up to a few yards I suppose Frank says this is "way off the target." Hi! All the best Frank...a third of those fifteen months are over already.

Ted, I beg pardon, Captain Peppercorn 2QJ has the same kind of address (apart from the same kind of call) as 2QL. But he even admits to being "somewhere in N.G." so we have "valuable information" as they so as to his whereabouts. 2QJ says his QRA is famous for the new "layer" as distinct from the Heaviside and Appleton layers. This is the Mosquito Layer which apart from the indirect QRM and QRM comes very very low at night and makes contact with the operators. Hi!

Having read of Roger Torrington and his speed. Ted nevertheless wants to be considered as a competitor with a big handicap against Roger and the other boys in dodging Zeros and Japanese Eggs. Hi! Having heard Roger, on his ability Ted, believe me you rate yourself pretty high. Tell you about how high when you get some leave....2Yc.

From as far away as his pen... J is able to give me news of two other Hams. This proves once again the old story of the will finding nothing much in the way. Hi!

L/C Davies is in the Middle East still along with SES. These two have been in the same outfit since they left VK. Its a pity we didn't get any news of SES from his pen. Perhaps if you read this, eventually, SADS you might even have a line about the happenings.

Sgt. Dooda SLD is still up at Tornville with Courtenay as he is quite high in the R.A.F. hierarchy these days, but we hear no news of them in detail.

John in Sydney at present, so they say... early in February. JSD is well... looking well and sporting two nice Continental cars and a big dog you enjoy our two months stay with us. (I wish he would come out here to L/C so I could bump him about news).

Also seen in Sydney but heading south to enjoy a couple of weeks well earned leave... Arthur Evans GPO. Arthur is now in the A.A.W. and spends his time in Northern Italy.

Another old face to pop up again recently is that a long lost to Charles Miller GPO / L. L. Corporal Miller of the R.A.F. Still has his hand in with the big transporters. How do you more news of you Charlie?

One hears various things about the value of Hams in the Service. Talking to a Squadron Leader the following was his opinion. 'The value on the radio front is not really in my opinion, as people report one in five of the more highly qualified radio men in this area have come from amateur radio circles.' This is not a high praise and is a bit different from what I have heard some Hams say in earlier years of the War.

Now comes the Lord Rance Ford has at last got his Commission and will fill the Thames Force, so I hope to have some news of him by the next issue of notes.

Corp. Stevens FOF who is spending his time in a technical haven? somewhere off the north of Australia reports that the A.A.W. constantly monitor the outgoing traffic, whether by day or duty or not... at night the camp is pressed the camp lighting dims... must remind some of them of the good old days.

Major Lyle Andrews MBE of the A.A.W. has now been officially reported a prisoner of war in Malaya.

And that is that...pretty short and sweet this month. As usual when you read these notes from your R.A.R.L. or other stations or on your battleship, sloop, cargo ship or land station just remember that you, too, are in the drop line for YOUR COLUMN to Jim Corbin. 2VC, 78 LAURET ST, DUBLIN, I.S. ...or if you know 3RJ send it to him at Pt. Pigot.

73 and more for next month...2VC

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## D I V I S I O N A L   N O T E S

### ... Federal Headquarters ...

At the February meeting of the Executive members I learned with a little satisfaction that the VK6 Division had now received permission for the formation of an Emergency Communication Network. That is to say, and that several stations were in the course of construction. Like the South Isles, Western Australia has experienced no little difficulty in obtaining equipment, particularly valves. I interpreted holding their annual general meeting during February, and I hope that a report of proceedings will appear in the next issue of the magazine.

7BL, Retired Air is busy delving into VKL, Max Lovelace's past, and was responsible with other members of his unit for "unbubbling" inside the "war inner" and communicating with Australia from Timor. "Here there's a Ham There's a Wiv."

Reference was made some time ago regarding post war experimental radio and it was decided to contact both the A.R.R.L. and I.S.R.S. in an endeavor to ascertain what steps if any, had been taken or anticipated regarding the allocation of frequencies after the war. It has now been decided to extend the range of communication further by including all known active English bodies.

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## EMERGENCY COMMUNICATION NETWORK

### ..... Stations Stand By During Sydney's Alert .....

On Monday night the 19th of February an unidentified aircraft was heard by anti-aircraft Defence units, flying in the direction of Sydney, and as all efforts to obtain recognition proved fruitless, Servico Chiefs believed that it was of enemy origin and ordered that the air raid warning system sound the "Alert", and at 11.00 p.m. the sirens wailed their warning. At 11.05 p.m. VLB JH notified Control that the station was manned and other stations followed in rapid succession.

As no raid eventuated, the stations were not called upon to handle any traffic much to the disappointment of the operators standing by at their posts, and when the "All Clear" sounded, a sleepy band of hams wound their way homewards. The manner in which these hams manned their stations was very satisfying to the officials in charge of the network, and these men are to be heartily congratulated upon their sense of duty.

At the 33rd Annual General Meeting of the Institute, Mr. Warren Garlick, representing the Premier, Mr. W. J. McKell, congratulated Members of the E.C.N. and the Wireless Institute of Australia generally, upon the great work done in organising the Network, and further stated that the Government intended handing over the control of the scheme entirely to the Division, with Mr. W. G. Ryan VK2YI as Government Representative. In his remarks, Mr. Garlick traced the history of the Network since its inception, paying particular tribute to the work of Messrs. Bennett, Friddle and Ryan, and that with the re-organisation of the State War Effort Co-Ordination Committee that body had no qualms whatsoever in handing the Network over to the Division.

Well, its arrived! What, you don't know? Why the Aerial Glanceover Relay for VL2JB, of course. Thanks to "Shorty" Higgins VL2LO and Gordon Wells, it is now possible to change from Transmit to Receive in a split second, due to a very fine piece of apparatus turned out by 2LO. This Relay would be an acquisition to any Commercial Station. Thanks a lot om.

Another arrival was VL2JL with a very fb signal. Although too late station in the Network to put a signal on the air apparently the boys over there who include George Littlefair VK2YV, Ivon Bailue VK2TN and George Paterson VK2AHJ who had been listening round a bit because VL2JL has well and truly snatched the Laurel wreath from 2JH. We don't know whether there is any truth in the rumor that a certain well known lady announcer from the National Station 2FC will be handling traffic from 2JL. Would you know, 2AHJ?

VL2JJ is putting in quite a strong signal at Control, but speech needs a bit of cleaning up, gang. George Sholey 2QK and his associates Arthur Springett 2OH, George Waldoek 2QU and Jack Keane 2JN have made quite a nice job of the antenna, but why those three longitudinal supports boys!

VL2JE gave the gang at Control quite a surprise with the strong signal that they put into VL2JB on a couple of Sunday afternoons. This station has quite an excellent radiating system. It uses a three element close spaced array perched at the top of a forty foot pole. It must have been worth while watching Don Reed 2DR climbing to the top, but it would have greater spectacle if the climber had been Jack McManara 2EQ! Other hams associated with 2JE are Jim Georgeson 2KU, Jack Dark 2ADQ, Ray Patterson 2AJW and Harry Laphorne 2HL. It is understood that 2EQ is arranging for Jim Gussey's Band to visit 2JE. Oh yeah!

Arrangements have been made for Section Leaders to visit Control, thus giving them an opportunity of looking over VL2JB and speaking to their stations from that location. A Roster has been drawn up so that every Member of the Network will make this

visit. Any member of the Institute who does not belong to the Network is at liberty to visit Control on the first Sunday in May, provided that early application is made.

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#### NEW SOUTH WALES DIVISION.

The Thirty Third Annual Meeting of the Division was held at Y.M.C.A. Buildings on Thursday 18th. February, 1945. Quite a large number of Members were present, and it is quite safe to say that it was one of the most representative meetings held since the outbreak of war, and to have heard the boys discussing the relative merits and demerits (if any) of their rigs was reminiscent of the "good old days".

The Annual Report published in February "Amateur Radio" was unanimously adopted, and the Council congratulated upon its fine record for the year.

With reference to the Election of Officers, only seven nominations were received, viz., R.A. Friddle, L. Mashman, E. Hodgkins, C. Fryar, H. Peterson, P. Dickson and R. Miller, thus making a ballot unnecessary, and these Members were duly declared elected Councillors. The Chairman pointed out that the Articles and Memorandum of Association stated that the Institute shall be governed by a Council consisting of seven Members, and as soon as possible after the Annual General Meeting that body - that is, the Council, would elect a Chairman and two Vice Chairmen from among its number, and also a Secretary and Treasurer from among the Members of the Institute. As the New Council will not meet until March, these appointments will be made known in the April issue of the magazine.

A presentation of a Gent's Toilet Set was made to Mr. Warren Garlick who is attached to the Premier's Department. Mr. Garlick has acted as liaison officer between the State War Effort Co-Ordination Committee and the Institute and anticipates being called up for Active duty with the Navy very soon. Whilst occupying the position of Liaison Officer, he has been very considerate towards the Institute, and no reasonable request was ever refused and it was decided that he should be the recipient of a small presentation as a token of the high esteem in which he is held by Members of the Division. In thanking the Members for the gift Mr. Garlick stated that his associations with the W.I.A. had always been happy ones, and trusted that the friendships he had made would be enduring.

Members were informed that the Prisoner's of War Fund now totalled £17/11/6 and that a further donation of £1/1/- had been received from Reg Fagan VKERJ, making his total subscriptions to date, four guineas.

The Meeting was informed that during the month, Ed Remorenko WSGUF and Joe Reoley WLAIW had been entertained, and as the result of an appeal made for more Members to extend hospitality to visiting

Amateurs Messrs. Don Read 2Dr. J. Thompson, 2XP, H. Caldecott 2DA and Ivon Bailue 2TN volunteered to assist. Should any other member be willing to entertain a "Yank" or any other visiting ham, would they please let the Divisional Secretary have their name and address and particulars of when they would be available. The usual practice is for the VK ham to invite any of these overseas visitors home for dinner and collect as many as possible of the local lads afterwards. Most of the "W's are anxious to meet as many VK's as possible.

One minute's silence was observed in memory of C. P. Bartholomew who went to meet the Great Brass pounder on Christmas Day. C.P.B. was one of the signatories to the Articles and Memorandum of Association, and a Life Member of the Institute.

An interesting demonstration of a piece of very high frequency apparatus was given by Mr. Percy Dickson VK2AFB and this Lecture held the attention of members right throughout.

The next meeting of the Division will be held at Y.M.C.A. Buildings on Thursday 18th March, and all amateurs are invited to be present.

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#### V I C T O R I A N   D I V I S I O N

The attendance at the Division's meetings seem to be improving, more being at the March meeting than is usual. During the evening, Alex Clyne 3VX gave a short explanation of his theory to the problem published last month.

The April meeting will be held on Tuesday, 6th April,.

For sometime Ivor Morgan has been working on plans so that a concrete working scheme can be put up to the authorities when the division presses its claim to establish an Emergency communication Network in this state. In order to obtain knowledge of Hams who still remain and would be available to man stations, should permission be granted, they are asked to forward their names and addresses to the Divisional Secretary, Box 2611 W G.P.O. Melbourne.

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The Problem:- Two further solutions to the problem have been received and these will be published in the April issue of the Magazine.

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Published by the Victorian Division of the Wireless  
Institute of Australia.

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Councillors: V. BENNETT, VK2VA; N. GOUGH,  
VK2NG; R. SMITH, VK2AIU; R. MILLER.

The Division meets on the Third Thursday of each month at Y.M.C.A. Buildings, Pitt Street, Sydney, and an invitation is accorded to all Amateurs to be present.

**H A M S !**

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BACK ON THE AIR?**



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**VICTORIA:**

BOX 2611W, G.P.O., MELBOURNE.

**QUEENSLAND:**

BOX 1524V, G.P.O., BRISBANE

**SOUTH AUSTRALIA:**

BOX 284D, G.P.O., ADELAIDE.

**WESTERN AUSTRALIA:**

BOX N.1002, G.P.O., PERTH.

**TASMANIA:**

BOX 547E, G.P.O., HOBART.